

Low-Nickel Diet Scoring System for Systemic Nickel Allergy

Mona Mislankar, BS* and Matthew J. Zirwas, MD†

Background: Consumption of nickel in the diet leads to spongiotic dermatitis in a dose-related fashion in individuals who are allergic to nickel. Dietary modification to reduce nickel intake leads to resolution of this dermatitis.

Objective: This study aims to create an evidence-based, user-friendly diet to assist patients in reducing dietary nickel intake.

Methods: Food and Drug Administration data on the nickel content of foods were combined with serving size information to calculate the upper limit of nickel per serving for a variety of foods. Based on these calculations, a point system was created that allows patients to reduce their nickel intake below the typical threshold for elicitation of the spongiotic dermatitis.

Conclusions: A simplified point-based diet can help patients with dermatitis due to dietary nickel consumption.

Although nickel has long been acknowledged as a cause of allergic contact dermatitis, it has more recently become widely recognized that pruritic dermatoses can arise from dietary nickel consumption in a dose-dependent fashion.¹ The most common systemic reactions in nickel-allergic patients include vesicular hand dermatitis and/or a generalized eczematous reaction.² Less common, but well described, presentations include a papuloerythroderma-like eruption and pruritis ani.^{3,4} Studies demonstrate that the use of dietary nickel modification in these nickel-allergic patients can result in improvement of such cutaneous manifestations.^{1-3,5}

OBJECTIVE/METHODS

Following an avoidance-based diet without specific recommendations regarding allowable amounts of nickel-containing foods is extremely difficult. To provide a more user-friendly diet that would increase compliance, the authors sought to develop a point-based system, similar to successful commercial weight control systems. A similar scoring system was recently developed for dietary cobalt avoidance.⁶

The Total Diet Study published by the Food and Drug Administration (FDA) reports the mean concentration of nickel in many of the foods and food groups representing the major component of the typical US diet.⁷ Using FDA-approved metric serving sizes,⁸ the authors converted the mean nickel concentration (reported in milligrams per kilogram) into absolute amounts (microgram per standard serving size). Based on the assumption that Americans frequently consume larger portions than 1 standard serving size, this original nickel content (microgram per standard serving size) was doubled to arrive at microgram per serving. Each food was then assigned a score from 0 to 10: 0 if less than 1 µg/serving, 1 if 1 to 10 µg/serving, 2 if 11 to 20 µg/serving, and so on, up to 10 if 90 to 100 µg/serving. Any foods with more than 100 µg/serving are listed as "avoid" (Table 1). In addition, instructions based on the authors' experience were developed to be given with the diet.

RECOMMENDATIONS

The estimated average daily intake of nickel with a normal diet ranges from 220 to 350 µg daily, and 1% of nickel-allergic patients will have a cutaneous reaction to 220 µg.¹ Therefore, the authors recommend that patients who are experiencing cutaneous reactions thought to be due to dietary nickel limit their consumption to less than 150 µg/d. Because children have a lower body weight than adults and there are no data regarding dose-response in children, the authors empirically recommend no more than 100 µg/d for children. Given that responses to dietary nickel are on a dose-response curve, there will be rare patients who react to less than 150 µg/d. The authors' opinion is that the lowest reasonably possible nickel intake per day would be 5 points, so this cutoff was set as the most restrictive level.

From the *College of Medicine, University of Cincinnati; and †Division of Dermatology, The Ohio State University Wexner Medical Center, Columbus.

Address reprint requests to Matthew J. Zirwas, MD, Division of Dermatology, The Ohio State University Wexner Medical Center, 540 Officenter Pl, Suite 240, Gahanna, OH 43230. E-mail: matt.zirwas@osumc.edu.

The authors have no funding or conflicts of interest to declare.

DOI: 10.1097/DER.0b013e3182937e81

© 2013 by the American Contact Dermatitis Society. All Rights Reserved.

TABLE 1. Instructions for Low-Nickel Diet

1. It may take up to 2 months to see the benefits from following this diet.
 2. Adults should consume no more than 15 points per day.
 3. Children younger than 12 years should consume no more than 10 points per day.
 4. Very rare individuals are even more sensitive than this and may need to stay under 5 points per day.
 5. In general, even if not listed specifically, avoid anything with beans, chocolate, peanuts, soy, oatmeal, or granola.
 6. Only bottled/distilled water should be consumed, either by drinking or in cooking.
 7. Avoid cooking acidic foods in stainless steel cookware. Acidic foods include tomatoes, vinegar, and citrus. Types of cookware that are safe: nonstick coated of any type, aluminum, copper, cast iron.
 8. Do not take any vitamins or supplements except for vitamin C. However, this diet is relatively low in fiber, so if you are prone to constipation, it may be beneficial to take a stool softener, such as docusate sodium.
 9. Take a chewable 500-mg or 1000-mg vitamin C tablet with every meal—this helps to prevent nickel from being absorbed. It must be taken at the beginning, middle, or end of each meal. It does not do any good to take it at times other than when eating—the vitamin C must be in the stomach at the same time as the food.
- The information on which the diet is based can be found at this Web site: <http://www.fda.gov/downloads/Food/FoodSafety/FoodContaminantsAdulteration/TotalDietStudy/UCM184301.pdf>

Nickel Diet Foods Listed by Point Value (Page 1)

Apple	0	Cheese, American, processed	1
Beer	0	Chicken breast, fried with skin	1
Butter or margarine	0	Chicken leg, fried with skin	1
Candy, hard	0	Chicken, roasted skinless	1
Cheese, cheddar	0	Chuck roast, beef	1
Cheese, Swiss	0	Coffee	1
Chicken breast, skin removed	0	Coffee, decaffeinated	1
Coffee creamer, nondairy	0	Coleslaw	1
Cottage cheese	0	Collards	1
Cream cheese	0	Cookies, sugar	1
Eggplant	0	Corn/hominy grits	1
Eggs	0	Cornbread	1
Fruit drink	0	Crackers (non-whole wheat)	1
Half and half cream	0	Cranberry juice cocktail	1
Honey	0	Cucumber	1
Ice cream, vanilla	0	English muffin, plain	1
Jello	0	Fruit juice blend	1
Jelly	0	Grape juice	1
Lunch meat (chicken, turkey, or ham)	0	Grapefruit	1
Maple syrup	0	Grapes	1
Mayonnaise	0	Gravy, canned or bottled	1
Milk, white	0	Ham, cured, baked	1
Mushrooms	0	Hotdog	1
Olive oil	0	Lamb chop	1
Popsicle	0	Lemonade	1
Salad dressing	0	Liver (beef/calf)	1
Soda/pop/cola	0	Lunch meat, salami	1
Sour cream	0	Macaroni and cheese	1
Steak	0	Macaroni salad	1
Sugar	0	Meatloaf	1
Tuna, canned	0	Muffin, fruit or plain	1
Vegetable oil	0	Noodles, egg	1
Apple juice	1	Okra	1
Applesauce	1	Olives	1
Bacon	1	Onion	1
Bagel, plain	1	Orange	1
Banana	1	Orange juice	1
Beets	1	Pickles, dill	1
Bologna	1	Pork chop	1

(Continued on next page)

TABLE 1. (Continued)**Nickel Diet Foods Listed by Point Value (Page 2)**

Bread, white	1	Pork roast	1
Broccoli	1	Potato chips	1
Brussel sprouts	1	Pretzels	1
Cabbage	1	Raisins	1
Carrot	1	Rice, white	1
Cauliflower	1	Sausage	1
Celery	1	Sherbet	1
Cereal, corn flakes	1	Shrimp	1
Cereal, cream of wheat	1	Soup, oriental noodles—ramen	1
Cereal, raisin bran cereal	1	Spaghetti	1
Cereal, shredded wheat	1	Spaghetti with meat sauce	1
Squash, summer	1	Asparagus	3
Sweet and sour sauce	1	Beef stroganoff with noodles	3
Tomato	1	Cereal, fruit flavored	3
Tomato catsup	1	Chicken nuggets, fast food	3
Tomato salsa, bottled	1	Chicken with vegetables in sauce	3
Tortilla chips, corn	1	Doughnut	3
Turkey breast	1	Meal replacement shake	3
Turnip	1	Peach	3
Wine, red/white	1	Peanut butter	3
Yellow mustard	1	Pineapple	3
Apple pie	2	Pizza, cheese and pepperoni	3
Avocado	2	Pumpkin pie	3
Biscuits	2	Rice, fried and meatless	3
Bread, wheat or rye	2	Soup, vegetable beef, canned	3
Cake, yellow with icing	2	Stew—beef and vegetable	3
Candy bar, chocolate, nougat, nuts	2	Taco/tostada with beef and cheese	3
Cantaloupe	2	Tomato sauce, bottled	3
Catfish	2	Tuna noodle casserole	3
Cereal, crisped rice	2	Vegetables, mixed	3
Chicken filet sandwich-broiled	2	Watermelon	3
Chocolate chip cookies	2	Beef with vegetables in sauce	4
Cookies (Oreo type)	2	Chicken potpie, frozen	4
Corn	2	Clam chowder	4
English muffin—egg, cheese, ham	2	French fries	4
Fish sandwich, fast food	2	Fruit cocktail, canned	4
Fish sticks or patty	2	Milk, chocolate	4
Grapefruit juice	2	Peas, frozen	4
Green beans	2	Soup, tomato, canned	4
Hamburger	2	Tomato juice	4
Lettuce	2	Granola bar with raisins	5
Pancakes	2	Beans, white	6
Peanuts	2	Brownie	6
Pear	2	Cereal, granola with raisins	6
Pepper, green	2	Chocolate	6
Popcorn	2	Chocolate syrup	6
Poptart/toaster pastry	2	Pineapple juice	6
Potato salad	2	Lasagna with meat	7
Potato, baked or boiled	2	Prune juice	7
Pudding, not chocolate	2	Burrito with beef, beans, cheese	8
Soup, chicken noodle, canned	2	Milk shake, chocolate	8
Spinach	2	Oatmeal	9
Squash, winter	2	Soup, bean, bacon, pork-canned	10
Strawberries	2	Cake, chocolate with icing	Avoid

(Continued on next page)

TABLE 1. (Continued)

Sweet potatoes	2	Cereal, oat ring	Avoid
Sweet roll/Danish pastry	2	Chili with beans, canned	Avoid
Tea, decaffeinated	2	Lima beans	Avoid
Tea, from tea bag	2	Pinto beans	Avoid
Tortilla, flour	2	Pork and beans	Avoid
Yogurt	2	Refried beans	Avoid
Apricots	3	Sunflower seeds, shelled	Avoid
Nickel Diet Foods Listed Alphabetically (Page 1)			
Apple	0	Chicken potpie, frozen	4
Apple juice	1	Chicken with vegetables in sauce	3
Apple pie	2	Chicken, roasted skinless	1
Apple sauce	1	Chili with beans, canned	Avoid
Apricots	3	Chocolate	6
Asparagus	3	Chocolate chip cookies	2
Avocado	2	Chocolate syrup	6
Bacon	1	Chuck roast, beef	1
Bagel, plain	1	Clam chowder	4
Banana	1	Coffee	1
Beans, white	6	Coffee creamer, nondairy	0
Beef stroganoff with noodles	3	Coffee, decaffeinated	1
Beef with vegetables in sauce	4	Coleslaw	1
Beer	0	Collards	1
Beets	1	Cookies (Oreo type)	2
Biscuits	2	Cookies, sugar	1
Bologna	1	Corn	2
Bread, wheat or rye	2	Corn/hominy grits	1
Bread, white	1	Cornbread	1
Broccoli	1	Cottage cheese	0
Brownie	6	Crackers (non-whole wheat)	1
Brussel sprouts	1	Cranberry juice cocktail	1
Burrito with beef, beans, cheese	8	Cream cheese	0
Butter or margarine	0	Cucumber	1
Cabbage	1	Doughnut	3
Cake, chocolate with icing	Avoid	Eggplant	0
Cake, yellow with icing	2	Eggs	0
Candy bar, chocolate, nougat, nuts	2	English muffin—egg, cheese, ham	2
Candy, hard	0	English muffin, plain	1
Cantaloupe	2	Fish sandwich, fast food	2
Carrot	1	Fish sticks or patty	2
Catfish	2	French fries	4
Cauliflower	1	Fruit cocktail, canned	4
Celery	1	Fruit drink	0
Cereal, corn flakes	1	Fruit juice blend	1
Cereal, cream of wheat	1	Granola bar with raisins	5
Cereal, crisped rice	2	Grape juice	1
Cereal, fruit flavored	3	Grapefruit	1
Cereal, granola with raisins	6	Grapefruit juice	2
Cereal, oat ring	Avoid	Grapes	1
Cereal, raisin bran cereal	1	Gravy, canned or bottled	1
Cereal, shredded wheat	1	Green beans	2
Cheese, American, processed	1	Half and half cream	0
Cheese, cheddar	0	Ham, cured, baked	1
Cheese, Swiss	0	Hamburger	2
Chicken breast, fried with skin	1	Honey	0

(Continued on next page)

TABLE 1. (Continued)**Nickel Diet Foods Listed Alphabetically (page 2)**

Chicken breast, skin removed	0	Hot dog	1
Chicken filet sandwich-broiled	2	Ice cream, vanilla	0
Chicken leg, fried with skin	1	Jello	0
Chicken nuggets, fast food	3	Jelly	0
Lamb chop	1	Pudding, not chocolate	2
Lasagna with meat	7	Pumpkin pie	3
Lemonade	1	Raisins	1
Lettuce	2	Refried beans	Avoid
Lima beans	Avoid	Rice, fried and meatless	3
Liver (beef/calf)	1	Rice, white	1
Lunch meat (chicken, turkey, or ham)	0	Salad dressing	0
Lunch meat, salami	1	Sausage	1
Macaroni and cheese	1	Sherbet	1
Macaroni salad	1	Shrimp	1
Maple syrup	0	Soda/pop/cola	0
Mayonnaise	0	Soup, bean, bacon, pork—canned	10
Meal replacement shake	3	Soup, chicken noodle, canned	2
Meatloaf	1	Soup, oriental noodles—ramen	1
Milk shake, chocolate	8	Soup, tomato, canned	4
Milk, chocolate	4	Soup, vegetable beef, canned	3
Milk, white	0	Sour cream	0
Muffin, fruit or plain	1	Spaghetti	1
Mushrooms	0	Spaghetti with meat sauce	1
Noodles, egg	1	Spinach	2
Oatmeal	9	Squash, summer	1
Okra	1	Squash, winter	2
Olive oil	0	Steak	0
Olives	1	Stew—beef and vegetable	3
Onion	1	Strawberries	2
Orange	1	Sugar	0
Orange juice	1	Sunflower seeds, shelled	Avoid
Pancakes	2	Sweet and sour sauce	1
Peach	3	Sweet potatoes	2
Peanut butter	3	Sweet roll/Danish pastry	2
Peanuts	2	Taco/tostada with beef and cheese	3
Pear	2	Tea, decaffeinated	2
Peas, frozen	4	Tea, from tea bag	2
Pepper, green	2	Tomato	1
Pickles, dill	1	Tomato catsup	1
Pineapple	3	Tomato juice	4
Pineapple juice	6	Tomato salsa, bottled	1
Pinto beans	Avoid	Tomato sauce, bottled	3
Pizza, cheese and pepperoni	3	Tortilla chips, corn	1
Popcorn	2	Tortilla, flour	2
Popsicle	0	Tuna noodle casserole	3
Poptart/toaster pastry	2	Tuna, canned	0
Pork and beans	Avoid	Turkey breast	1
Pork chop	1	Turnip	1
Pork roast	1	Vegetable oil	0
Potato chips	1	Vegetables, mixed	3
Potato salad	2	Watermelon	3
Potato, baked or boiled	2	Wine, red/white	1
Pretzels	1	Yellow mustard	1
Prune juice	7	Yogurt	2

REFERENCES

1. Jensen CS, Menné T, Johansen JD. Systemic contact dermatitis after oral exposure to nickel: a review with a modified meta-analysis. *Contact Dermatitis* 2006;54(2):79–86.
2. Zirwas MJ, Molenda MA. Dietary nickel as a cause of systemic contact dermatitis. *J Clin Aesthet Dermatol* 2009;2(6):39–43.
3. Silvestri DL, Barmettler S. Pruritus ani as a manifestation of systemic contact dermatitis: resolution with dietary nickel restriction. *Dermatitis* 2011; 22(1):50–55.
4. Kato K, Satoh T, Tanaka T, et al. Systemic nickel allergy presenting as papuloerythroderma-like eruptions. *Acta Derm Venereol* 2010;90(6):655–656.
5. Joneja JV. Nickel allergy. *Dietary Management of Food Allergies and Intolerances: A Comprehensive Guide*. Vol. III. Port Coquitlam, B.C.: J.A. Hall Publications; 1995:247–261.
6. Stuckert J, Nedorost S. Low-cobalt diet for dyshidrotic eczema patients. *Contact Dermatitis* 2008;59(6):361–365.
7. Total Diet Study Statistics on Element Results based on 2006–2008 US Food and Drug Administration Market Baskets. Available at: <http://www.fda.gov/Food/FoodSafety/FoodContaminantsAdulteration/TotalDietStudy/ucm184232.htm>. Accessed on October 30, 2012.
8. US Food and Drug Administration CFR-Code of Federal Regulations Title 21. Available at: <http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=101.12>. Accessed on October 30, 2012.